



University of Cyprus
Department of Biological
Sciences

Postgraduate Seminars

Seminar Series 2018-2019

Dr. Kyriacos Leptos

Senior Research Associate,
University of Cambridge, UK

“Flagellar Photoresponse and Phototactic Steering in the Unicellular Alga *Chlamydomonas reinhardtii*”

Wednesday, 31 October 2018, at 17:00
Building CTF 01, Room 108, Panepistimioupoli Campus

This seminar is open to the public

Unicellular algae change their direction of swimming in response to a light stimulus, to satisfy their photosynthetic needs, a behaviour known as *phototaxis*. Our understanding of this process in biflagellate algae stems almost exclusively from the model species *Chlamydomonas reinhardtii*, via studies of its flagella, eyespot and steering. However, no comprehensive model linking all these aspects of its physiology and behaviour has been constructed and tested experimentally. In this talk, I will present a mathematical model that we have developed by coupling an adaptive flagellar photoresponse to rigid-body dynamics tailored to details of flagellar beating. We corroborate the model with experimental data -- at the *flagellar* and *tactic* levels -- to explain the accurate phototactic steering of this alga. Firstly, at the flagellar level, we validate the hypothesized adaptive flagellar photoresponse using high spatio-temporal resolution methodology on immobilized cells. Secondly, at the tactic level, we corroborate the predicted reorientation dynamics of phototactic swimmers using 3D-tracking of free-swimming cells. Finally, we reconfirm, both theoretically and experimentally, that the adaptive nature of the response has peak fidelity at a frequency of about 1.6 Hz, corresponding to the rotation frequency of the cell body.